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Research Article

An updated synthesis of the Geophilomorpha (Chilopoda) of Asian Russia

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Abstract

A comprehensive overview of the state of knowledge on the Chilopoda Geophilomorpha of the Asian part of Russia is presented, based on the critical revision of all published morphological descriptions and all geographical records. Revised diagnoses for all the 38 nominal species so far reported from Asian Russia are given, with comments on their validity. Among them a total of 18 species are recorded only from this region and many of them from a single locality only. The species belong to Geophilidae s. l., (in the genera *Arctogeophilus*, *Geophilus*, *Pachymerium*, and *Strigamia*), Schendylidae (*Escaryus*), and Mecistocephalidae (*Agnostrup*, *Arrup*, and *Tygarrup*). At least two species have been introduced, namely *Geophilus flavus* and *Tygarrup javanicus*. The history of studies on the Geophilomorpha in the Asian part of Russia are also summarized.

Key words: Biodiversity, fauna, Geophilidae, Mecistocephalidae, Russian Far East, Schendylidae, Siberia

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Introduction

The fauna of Chilopoda Geophilomorpha of large part of the Palearctic region, especially the Asian part of Russia, is still badly understood in comparison with other regions. While the species recorded from Europe, including the European part of Russia, have been recently reviewed (Bonato and Minelli 2014; Volkova 2016), available information and records on the Geophilomorpha living in the Asian part of Russia are still scattered in many and relatively old publications. Moreover, the overall knowledge of many species is largely incomplete, with brief descriptions hardly accessible or comparable.

The present paper aims to provide a comprehensive overview of the state of knowledge of Geophilomorpha from Asian Russia, in order to promote and facilitate further taxonomic and faunistic investigations.

Material and methods

We searched the entire taxonomic, faunistic, and ecological literature, to the best of our abilities, to retrieve all taxonomic descriptions, morphological data, and occurrence records of Geophilomorpha from the Asian part of Russia.

For the taxonomy and nomenclature, we referred to Bonato et al. (2014) and ChiloBase (Bonato et al. 2016). For each nominal species, we produced a diagnosis by translating and interpreting its original description, other published morphological information reliably referring to the species, all published illustrations, and taxonomic opinions. We also added diagnoses for the genera. However, for the diagnoses of families we refer to Bonato (2011).

We referred the occurrence records to modern administrative units (Fig. 1). The translation of names of Russian administrative divisions into English follows Kazantsev (2022). The Asian part of Russia is a huge region from the Ural Mountains in the west to the Pacific Ocean in the east (Gvozdetskiy and Mikhailov 1978). It spans an area of 13.1 million square kilometers and is often divided into three regions: Western Siberia, Eastern Siberia, and Far East. Western Siberia (approximately between the Urals and the Yenisei River) includes the following administrative units: Yamalo-Nenets and Khanty-Mansi autonomous okrugs; Sverdlovsk, Chelyabinsk, Kurgan, Tyumen, Omsk, Tomsk, Novosibirsk, and Kemerovo oblasts; Altai krai; republics of Altai and Khakassia. Eastern Siberia (approximately between the Yenisei River and the watersheds that run parallel to the coast of the Pacific Ocean) includes the following units: Krasnoyarsk and Zabaykalsky krais; Irkutsk oblast; republics of Tuva, Buryatia, and Sakha (Yakutia); the western parts of Khabarovsk krai, Magadan oblast, and Chukotka autonomous okrug. Russian Far East (river basins flowing into the Pacific Ocean, as well as Wrangel, Commander, Shantar Islands, the Kuril, and Sakhalin) includes the following units: Amur and Sakhalin oblasts, the eastern part of Magadan oblast; Jewish autonomous oblast; the eastern part of Chukotka autonomous okrug; Kamchatka, Maritime krais, and the eastern part of Khabarovsk krai.

Families, genera within families, and species within genera are listed alphabetically (see also Table 1). For each species, we report the type locality/ies, both as indicated in the original publications and with their modern names; the estimated coordinates of the type locality/ies (only for species described from Asian Russia); information on the type material, including the depository (only for species described from Asian Russia or adjacent territories); references to all sources of records for Asian Russia, and to other selected publications that are relevant for the taxonomy, morphology, and distribution of the species; the distribution within Asian Russia and outside; and finally, remarks on the taxonomic status and distribution.

An asterisk (*) indicates nominal species whose taxonomic validity requires confirmation.

Abbreviations for depositories

NHMD Natural History Museum of Denmark, Copenhagen;
NHMW Natural History Museum Vienna (Austria);
ZISP Zoological Institute of the Russian Academy of Sciences (Saint Petersburg, Russia);
ZMH Zoological Museum in Hamburg (Germany);
ZMMU Zoological Museum of the Moscow State University (Moscow, Russia).

Figure 1. Administrative units of Asian Russia. Western Siberia: Chel – Chelyabinsk oblast, Sver – Sverdlovsk oblast, Kha – Khanty-Mansi autonomous okrug, Yam – Yamalo-Nenets autonomous okrug, Kur – Kurgan oblast, Tyum – Tyumen oblast, Omsk – Omsk oblast, Tomsk – Tomsk oblast, Novos – Novosibirsk oblast, Altkr – Altai krai, RepAlt – Republic of Altai, Kem – Kemerovo oblast, Khak – Republic of Khakassia; Eastern Siberia: Tuva – Republic of Tuva, Krasn – Krasnoyarsk krai, Irkut – Irkutsk oblast, Buryat – Republic of Buryatia, Zabayk – Zabaykalsky krai, Sakha – Republic of Sakha (Yakutia); Far East: Amur – Amur oblast, Khabar – Khabarovsk krai, Magad – Magadan oblast, Chukot – Chukotka autonomous okrug, Kamch – Kamchatka krai, Jewish – Jewish autonomous oblast, Marit – Maritime krai, Sakh – Sakhalin oblast.

Results

Family Geophilidae Leach, 1816

Genus *Arctogeophilus* Attems, 1909

Diagnosis. Geophilids with head distinctly elongate; clypeal areas present, variously distinct; labral side-pieces almost touching medially; second maxillary coxosternite medially very short and poorly sclerotized, with statuminia, without anterior inner processes; second maxillary pretarsus claw-like; forcipular tergite distinctly narrower than subsequent tergite, with pleurites exposed dorsally; forcipular coxosternite relatively broad posteriorly, without anterior denticles, with chitin-lines short or absent, with coxopleural sutures subparallel in their anterior half; forcipular trochanteroprefemur distinctly elongate, with distal denticle; forcipular tarsungulum with basal denticle; trunk sternites without “carpophagus” structures; ventral pore-fields usually absent; metasternite of ultimate leg-bearing segment longer than wide; coxopleura usually with sparse pores; legs of the ultimate pair longer than the penultimate legs, often without pretarsus. See Table 2.

Table 1. Nominal species of Geophilomorpha reported from Asian Russia: i – anthropochore introduction, * – uncertain taxonomic validity, ! – known from Asian Russia only.

№	Species	European Russia	Asian Russia		
			Western Siberia	Eastern Siberia	Far East
Family Geophilidae Leach, 1816					
Genus *Arctogeophilus* Attems, 1909					
1	*A. glacialis* (Attems, 1909)				+
2	*A. macrocephalus* Folkmanová & Dobroruka, 1960 *	+	+	+	+
3	*A. sachalinus* Verhoeff, 1934 * !				+
Genus *Geophilus* Leach, 1814					
4	*G. bipartitus* Takakuwa, 1937 !				+
5	*G. flavus* (De Geer, 1778)	+	+i	+	
6	*G. orientalis* Sseliwanoff, 1881 * !				+
7	*G. proximus* C.L. Koch, 1847	+	+		
8	*G. rhomboideus* Takakuwa, 1937				+
9	*G. sibiricus* Stuxberg, 1876 * !			+	
10	*G. sounkyoensis* Takakuwa, 1937				+
Genus *Pachymerium* C.L. Koch, 1847					
11	*P. ferrugineum* (C.L. Koch, 1835)	+	+		+
12	*P. pilosum* (Meinert, 1870) * !			+	+
Genus *Strigamia* Gray, 1843					
13	*S.* cf. *acuminata* (Leach, 1815)	+			+
14	*S. alokosternum* (Attems, 1927)				+
15	*S. hirsutipes* (Attems, 1927) *				+
16	*S. pusilla* (Sseliwanoff, 1884)	+	+	+	
17	*S. sacolinensis* (Meinert, 1870) * !				+
18	*S. sibirica* (Sseliwanoff, 1881) * !			+	
19	*S. sulcata* (Sseliwanoff, 1881) * !				+
20	*S.* cf. *transsilvanica* (Verhoeff, 1928)		+		+
Family Mecistocephalidae Bollman, 1893					
Genus *Agnostrup* Foddai, Bonato, Pereira & Minelli, 2003					
21	*A. striganovae* (Titova, 1975) !				+
Genus *Arrup* Chamberlin, 1912					
22	*A. dentatus* (Takakuwa, 1934)				+
23	*A. mamaevi* (Titova, 1975) !				+
Genus *Tygarrup* Chamberlin, 1914					
24	*T. javanicus* Attems, 1929		+i		
Family Schendylidae Cook, 1896					
Genus *Escaryus* Cook & Collins, 1891					
25	*E. chadaevae* Titova, 1973	+	+	+	
26	*E. chichibuensis* Shinohara, 1955 *				+
27	*E. dentatus* Titova, 1973 * !				+
28	*E. hirsutus* Titova 1973 * !				+
29	*E. japonicus* Attems, 1927 *	+	+	+	+
30	*E. koreanus* Takakuwa, 1937 *		+	+	+
31	*E. krivolutskiji* Titova, 1973 * !				+
32	*E. molodovae* Titova, 1973 * !				+
33	*E. perelae* Titova, 1973 * !				+
34	*E. polygonatus* Titova, 1973 * !				+
35	*E. retusidens* Attems, 1904	+	+		+
36	*E. sachalinus* Takakuwa, 1935				+
37	*E. sibiricus* Cook, 1899 !				+
38	*E. vitimicus* Titova, 1973 * !			+	

Table 2. Differences between species of the genus *Arctogeophilus* Attems, 1909 known from Asian Russia and adjacent territories.

Species	Characters		
	First maxillary lappets	**Denticles on forcipular intermediate articles**	**Ventral pore-fields**
A. glacialis (Attems, 1909)	short	slightly shorter than other denticles	absent
A. macrocephalus Folkmanová & Dobroruka, 1960	long	smaller than other denticles	on some anterior segments
A. sachalinus Verhoeff, 1934	long	absent	on some anterior segments
A. attemsi Folkmanová, 1956	long	absent	absent

1. *Arctogeophilus glacialis* (Attems, 1909)

Geophilus (*Arctogeophilus*) *glacialis* Attems 1909: 23.
Arctogeophilus glacialis – Attems 1929: 297; Chamberlin 1946: 182.
Cryophilus alaskanus Chamberlin 1919: 18 (synonymy by Chamberlin 1946: 182).

Type localities. Russia: Chukotka autonomous okrug: "Nunamo" (Attems 1909; see Remarks), "Konyam Bay im Senjavin Sund" (Attems 1909) = Penkigney Bay, ca 64°49'N, 172°53'W; USA: Alaska: "Port Clarence" (Attems 1909), ca 65°15'N, 166°51'W.

Type series. *Syntypes*: 7 specimens, including 3 males and 4 females. Deposited in NHMW (Ilie et al. 2009).

Diagnosis. A species of *Arctogeophilus* with first maxillary lappets relatively short; denticles on all forcipular articles; denticles on the forcipular intermediate articles only slightly shorter than those on trochanteroprefemur and tarsungulum; 39 leg-bearing segments, possibly invariably; ventral pore-fields absent; pretarsus of ultimate legs absent.

Distribution. Far East: Chukotka autonomous okrug (Attems 1909). Outside Asian Russia: Alaska and Canada (e.g., Attems 1909; Chamberlin 1946; Langor and Langor 2022).

Remarks. The position of the locality "Nunamo" (indicated by Attems 1909) is uncertain: the original material was collected during the Vega expedition, and Nordenskiöld (1882: 565, 567) mentioned a tent-village "Nunamo" located in Chukotka, but he did not indicate the precise position of this place. Instead, Nordenskiöld (1882: 565) provided coordinates for "Konyam Bay" = Penkigney Bay.

2. *Arctogeophilus macrocephalus* Folkmanová & Dobroruka, 1960 *

Arctogeophilus macrocephalus Folkmanová & Dobroruka, 1960: 1815.
Arctogeophilus sp. – Byzova and Chadaeva 1965: 333.
Arctogeophilus macrocephalus – Zalesskaja et al. 1982: 188; Ganin 1997: 105, 109, 112, 114, 129, 134, 141; Vorobiova 1999: 33; 2002: 63; Rybalov 2002: 83; Farzalieva 2008: 56; Volkova 2016: 671; Nefediev et al. 2017a: 8; 2017c: 221; 2018: 236; 2021: 37; Dyachkov and Tuf 2019: 25; Nefediev 2019: 24.

Type locality. Russia: Republic of Tatarstan: Chistopolsky District: "Bliz s. Zmievo" (Folkmanová and Dobroruka 1960) = near Zmievo village, ca 55°23'N, 50°43'E.

Type series. *Syntypes*: 20 specimens. Depository unknown.

Diagnosis. A species of *Arctogeophilus* with first maxillary lappets relatively long; denticles on all forcipular articles, those on intermediate articles smaller than those on trochanteroprefemur and tarsungulum; 35–43 leg-bearing segments; ventral pore-fields on some anterior segments; pretarsus of ultimate legs absent.

Distribution. Western Siberia: Sverdlovsk, Chelyabinsk, Tomsk, and Kemerovo oblasts, Altai krai, republics of Altai and Khakassia (Byzova and Chadaeva 1965; Zalesskaja et al. 1982; Farzalieva 2008; Nefediev et al. 2017a, 2017c, 2018, 2021; Nefediev 2019). Eastern Siberia: Republic of Tuva and Krasnoyarsk krai (Zalesskaja et al. 1982; Vorobiova 1999; Rybalov 2002; Vorobiova et al. 2002). Far East: Jewish autonomous oblast, Amur oblast, Khabarovsk and Maritime krais, Chukotka autonomous okrug, and Sakhalin oblast (Sakhalin and Kunashir islands) (Zalesskaja et al. 1982; Ganin 1997). Outside Asian Russia: westwards to Transcarpathia (Zalesskaja et al. 1982; Volkova 2016) and Eastern Kazakhstan (Dyachkov and Tuf 2019).

Remarks. Zalesskaja et al. (1982: 189) suggested this species can be a junior synonym of *A. glacialis* (Attems, 1909), and this is still in doubt (Nefediev et al. 2017a). Because of this uncertainty, the actual taxonomic status of the populations of *Arctogeophilus* from the Far East remains to clarify.

The type locality for *A. macrocephalus* has been sometimes reported erroneously in previous publications (e.g., Bonato and Minelli 2014).

3. *Arctogeophilus sachalinus* Verhoeff, 1934 *

Arctogeophilus sachalinus Verhoeff 1934: 15.
Arctogeophilus sachalinus – Takakuwa 1940: 135; Molodova 1973: 67; Kurcheva 1977: 45; Zalesskaja et al. 1982: 188; Ganin 1997: 121, 124, 126, 128, 134.

Type locality. Russia: Sakhalin oblast: "Insel Sachalin" (Verhoeff 1934) = Sakhalin Isl.

Type series. *Holotype*: male. Depository unknown.

Diagnosis. A species of *Arctogeophilus* with first maxillary lappets relatively long; forcipular denticles only on the trochanteroprefemur and tarsungulum, not on the intermediate articles; 39 leg-bearing segments, possibly invariably; ventral pore-fields on some anterior segments; pretarsus of ultimate legs absent.

Distribution. Far East: Sakhalin oblast (Sakhalin Isl.) (Verhoeff 1934; Takakuwa 1940; Molodova 1973; Kurcheva 1977; Ganin 1997), Maritime krai (Kurcheva 1977; Ganin 1997), and Chukotka autonomous okrug (Kurcheva 1977). Outside Asian Russia: no records.

Remarks. It has been suggested that *A. sachalinus* could be a junior synonym of *A. glacialis* (Attems, 1909) (Nefediev et al. 2017a). More generally, the actual taxonomic status of the populations of *Arctogeophilus* from the Far East remains to clarify.

Genus *Geophilus* Leach, 1814

Diagnosis. Geophilids with head usually only slightly elongate; clypeal areas usually not distinct; labral side-pieces distinctly separated by an intermediate

part; second maxillary coxosternite medially long and sclerotized, without both statuminia and anterior inner processes; second maxillary pretarsus claw-like or reduced; forcipular tergite approximately as broad as the subsequent tergite, covering most part of the pleurites; forcipular coxosternite usually wider than long, gradually narrowing posteriorly, without anterior denticles, with chitin-lines, with coxopleural sutures diverging anteriorly also in their anterior half; forcipular trochanteroprefemur only moderately elongate, usually without denticles; forcipular tarsungulum with at most a small basal denticle; trunk sternites often with "carpophagus" pits and often with ventral pore-fields, usually a transverse band on the posterior part of the sternite; metasternite of the ultimate leg-bearing segment usually wider than long; coxopleura with sparse ventral pores, most of them close to metasternite; pretarsus of ultimate leg pair claw-like or reduced. See Table 3.

Table 3. Differences between species of the genus *Geophilus* Leach, 1814 known from Asian Russia.

Species	Characters				
	Leg-bearing segments	**"Carpophagus" pits**	**Ventral pore-fields on the anterior metasternites**	**Coxal pores**	**Anal pores**
G. bipartitus Takakuwa, 1937	35–39	present	transverse diamond	all close to the margin of metasternite	present
G. flavus (De Geer, 1778)	37–61	absent	transverse band	all close to the margin of metasternite	present
G. orientalis Sseliwanoff, 1881	39	?	?	on the ventral and lateral sides of coxopleura	present
G. proximus C.L. Koch, 1847	45–55	present	an entire posterior diamond	all close to the margin of metasternite	present
G. rhomboideus Takakuwa, 1937	43–49	present	transverse diamond	most pores close to the margin of metasternite and one pore located separately	present
G. sibiricus Stuxberg, 1876	57–59	?	?	on the ventral and lateral sides of coxopleura	absent
G. sounkyoensis Takakuwa, 1937	55–57	present	transverse band and sparse pores	most pores close to the margin of metasternite and one pore located separately	present

4. *Geophilus bipartitus* Takakuwa, 1937

Geophilus bipartitus Takakuwa 1937b: 285.

Geophilus bipartitus – Takakuwa 1937c: 80; 1940: 104; Molodova 1973: 67; Kurcheva 1977: 45.

Type locality. Russia: Sakhalin oblast: Sakhalin Isl.: "Otako (Chikuka)" (see Remarks) (Takakuwa 1937c).

Type series. ***Syntypes*:** unknown number of specimens, both sexes. Depository unknown.

Diagnosis. A species of *Geophilus* with head slightly longer than wide, 35–39 leg-bearing segments; "carpophagus" pits present, up to as wide as the metasternites; ventral pore-fields present, an entire posterior diamond on the anterior metasternites, absent on most of the posterior metasternites, two paired posterior groups on the penultimate metasternite; metasternite of ultimate leg-bearing segment wider than long; a few coxal pores on each coxopleuron, all close to the margin of metasternite; pretarsus of ultimate leg pair claw-like; anal pores present.

Distribution. Far East: Sakhalin oblast (Sakhalin and Kurile Islands) (Takakuwa 1937b; Molodova 1973; Kurcheva 1977). Outside Asian Russia: no records.

Remarks. The current identity and position of the locality "Otako (Chikuka)" (indicated by Takakuwa 1937c) is uncertain.

5. *Geophilus flavus* (De Geer, 1778)

Geophilus longicornis Leach 1815: 386 (synonymy by Stuxberg 1871: 508).
Arthronomalus longicornis – Gerstfeldt 1859: 275; Sseliwanoff 1884: 90.
Necrophloeophagus longicornis – Brolemann 1930: 151.
Schizotaenia ornata Folkmanová & Dobroruka, 1960: 1816 (synonymy by Bonato and Minelli 2014: 41).
Geophilus flavus – Nefediev et al. 2017a: 9.

Type locality. Unknown, possibly in France (Bonato and Minelli 2014).

Diagnosis. A species of *Geophilus* with head ~ 1.2× as long as wide; antennal articles ≤ 2× as long as wide; second maxillary pretarsus claw-like, longer than surrounding setae; forcipular trochanteroprefemur ~ 1.5× as long as wide; forcipular trochanteroprefemur, femur, and tibia without denticles; tarsungulum bearing a small basal denticle; 37–61 leg-bearing segments; "carpophagus" pits absent; ventral pore-fields present, an entire transverse posterior band on the anterior metasternites, two paired posterior groups on the posterior metasternites; metasternite of ultimate leg-bearing segment wider than long; up to a dozen coxal pores on each coxopleuron, all close to the margin of metasternite; pretarsus of ultimate leg pair claw-like; anal pores present.

Distribution. Western Siberia: Tomsk oblast (Nefediev et al. 2017a). Eastern Siberia: Zabaykalsky krai (Gerstfeldt 1859, as *Arthronomalus longicornis*). Outside Asian Russia: Western Palaearctic (e.g., Bonato et al. 2005; Stoev 2007).

Remarks. The record from Western Siberia seems to be due to anthropochore introduction (Nefediev et al. 2017a), while the record from Eastern Siberia requires confirmation (see Discussion).

6. *Geophilus orientalis* Sseliwanoff, 1881 *

Geophilus orientalis Sseliwanoff 1881: 4.
Geophilus orientalis – Sseliwanoff 1884: 80; Attems 1903a: 45; 1903b: 235; 1929: 329.

Type locality. Russia: Khabarovsk krai: "Nikolaevsk na Amure" (Sseliwanoff 1881) = Nikolayevsk-on-Amur city, 53°8'N, 140°42'E.

Type series. *Holotype*: male. Deposited in ZISP.

Diagnosis. A species of *Geophilus* with head slightly longer than wide; forcipular coxosternite with short and wide denticles; all forcipular articles with small denticles, except the tarsungulum; 39 leg-bearing segments; metasternite of ultimate leg-bearing segment longer than wide, only slightly narrowing backwards; numerous coxal pores, on the ventral and lateral sides of coxopleura; anal pores present.

Distribution. Far East: Khabarovsk krai (Sseliwanoff 1881, 1884). Outside Asian Russia: no records.

Remarks. The species was originally described under the genus *Geophilus*, but its taxonomic position is considered uncertain since Attems (1929). The few morphological characters reported in the descriptions and keys by Sseliwanoff (1881, 1884) do not allow it to be assigned confidently to one of the known genera.

7. *Geophilus proximus* C.L. Koch, 1847

Geophilus proximus – Sseliwanoff 1881: 6. 1884: 87; Titova 1969: 165; Zalesskaja et al. 1982: 188; Poryadina 1991: 14; Striganova and Poryadina 2005: 130; Farzalieva 2008: 58; Bukhkalo and Sergeeva 2012: 61; Bukhkalo et al. 2014: 73; Sergeeva 2013: 530; 2014: 72; Volkova 2016: 673; Nefediev et al. 2017a: 9; 2017b: 114; Dyachkov and Tuf 2019: 25; Nefediev 2019: 24; Bragina et al. 2020: 30.

Type locality. GERMANY: near Regensburg (Bonato and Minelli 2014).

Diagnosis. A species of *Geophilus* with head slightly longer than wide; antennal articles ≤ ~ 1.5× as long as wide; second maxillary pretarsus claw-like, longer than surrounding setae; forcipular trochanteroprefemur slightly longer than wide; forcipular trochanteroprefemur, femur, and tibia without denticles; forcipular tarsungulum bearing a small basal denticle; 45–55 leg-bearing segments; "carpophagus" pits present, up to as wide as the metasternites; ventral pore-fields present, an entire posterior diamond on the anterior metasternites, absent on the posterior metasternites; metasternite of ultimate leg-bearing segment wider than long; up to a dozen coxal pores on each coxopleuron, all close to the margin of metasternite; pretarsus of ultimate leg pair claw-like; anal pores present.

Distribution. Western Siberia: "Western Siberia" (Sseliwanoff 1881); Sverdlovsk, Chelyabinsk, Tyumen, Omsk, Novosibirsk, Kemerovo, and Tomsk oblasts, Altai krai, Republic of Khakassia (Zalesskaja et al. 1982; Poryadina 1991; Striganova and Poryadina 2005; Farzalieva 2008; Bukhkalo and Sergeeva 2012; Sergeeva 2013, 2014; Bukhkalo et al. 2014; Nefediev et al. 2017a, 2017b, 2021; Nefediev 2019). Outside Asian Russia: Northern Europe (Bonato et al. 2005).

8. *Geophilus rhomboideus* Takakuwa, 1937

Geophilus rhomboideus Takakuwa 1937b: 284.
Geophilus rhomboideus – Takakuwa 1937c: 78; 1940: 101; Kurcheva 1977: 45.

Type localities. RUSSIA: Sakhalin oblast: "Sachalin (Tomaruoru (= Tomari city, 47°45'N, 142°3'E), Maoka (= Kholmsk city, 47°02'N, 142°02'E), Sirutori (= Makarov city, 48°37'N, 142°46'E))" (Takakuwa 1937c).

Type series. *Syntypes*: unknown number of specimens, both sexes. Depository unknown.

Diagnosis. A species of *Geophilus* with head approximately as long as wide; second maxillary pretarsus claw-like and relatively long; forcipular trochantero-prefemur, femur, and tibia without denticles; forcipular tarsungulum bearing a small basal denticle; 43–49 leg-bearing segments; "carpophagus" pits present, up to as wide as the metasternites; ventral pore-fields present, an entire posterior diamond on the anterior metasternites; metasternite of ultimate leg-bearing segment wider than long; a few coxal pores on each coxopleuron, most of them close to the margin of metasternite and one pore located separately; pretarsus of ultimate leg pair claw-like; anal pores present.

Distribution. Far East: Sakhalin oblast (Sakhalin Isl.) (Takakuwa 1937b, 1937c; Kurcheva 1977). Outside Asian Russia: Japan (Takakuwa 1937c).

9. *Geophilus sibiricus* Stuxberg, 1876 *

Geophilus sibiricus Stuxberg 1876a: 31.

Geophilus sibiricus – Stuxberg 1876b: 315; Sseliwanoff 1884: 90; Attems 1903a: 45; 1903b: 235; 1929: 329.

Type locality. Russia: Krasnoyarsk krai: "Krasnojarsk" (Stuxberg 1876b) = Krasnoyarsk city, 56°0'N, 92°53'E.

Type series. *Syntypes*: 3 females. Depository unknown.

Diagnosis. A species of *Geophilus* with head ~ 1.2× as long as wide; tarsungulum without basal denticle; 57–59 leg-bearing segments; more than a dozen coxal pores on each coxopleuron, both on the ventral and lateral sides; pretarsus of ultimate leg pair claw-like; anal pores absent.

Distribution. Eastern Siberia: Krasnoyarsk krai (Stuxberg 1876b). Outside Asian Russia: no records.

Remarks. The species was originally described under the genus *Geophilus*, but its taxonomic position was considered uncertain since Attems (1929). The few morphological characters reported in the descriptions by Stuxberg (1876a, 1876b) do not allow to confidently assign it to one of the known genera.

10. *Geophilus sounkyoensis* Takakuwa, 1937

Geophilus sounkyoensis Takakuwa 1937b: 283.

Geophilus sounkyoensis – Takakuwa 1937c: 77; 1940: 99; Ghilarov and Perel 1973: 46; Kurcheva 1977: 45; Ganin 1997: 121, 124, 126, 128.

Type locality. Japan: Hokkaido: "Sounkyo" (Takakuwa 1937c).

Type series. *Syntypes*: unknown number of specimens, both sexes. Depository unknown.

Diagnosis. A species of *Geophilus* with second maxillary pretarsus claw-like, longer than surrounding setae; forcipular trochanteroprefemur slightly longer than wide; forcipular trochanteroprefemur, femur and tibia without denticles; forcipular tarsungulum bearing a small basal denticle; 55–57 leg-bearing segments; "carpophagus" pits present, up to as wide as the metasternites; ventral pore-fields present, an entire posterior band and other sparse pores on the

anterior metasternites, absent on the posterior metasternites; metasternite of ultimate leg-bearing segment wider than long; a few coxal pores on each coxopleuron, most of them close to the margin of metasternite and one pore located separately; anal pores present.

Distribution. Far East: Maritime krai (Ghilarov and Perel 1973; Kurcheva 1977; Ganin 1997). Outside Asian Russia: Japan (Takakuwa 1937b, 1937c, 1940).

Genus *Pachymerium* C.L. Koch, 1847

Diagnosis. Geophilids with head distinctly elongate; clypeal areas distinct; labral side-pieces distinctly separated by an intermediate part; second maxillary coxosternite medially long and sclerotized, without both statuminia and anterior inner processes; second maxillary pretarsus claw-like; forcipular tergite distinctly narrower than subsequent tergite, with pleurites exposed dorsally; forcipular coxosternite relatively broad posteriorly, with coxopleural sutures subparallel in their anterior half; forcipular trochanteroprefemur distinctly elongate, with distal denticle; chitin-lines present but short; forcipular tarsungulum with basal denticle; trunk sternites without "carpophagus" structures; ventral pore-fields present at least on the anterior part of the trunk, two paired anterior groups and a posterior entire transverse band on each sternite; metasternite of ultimate leg-bearing segment approximately as long as wide or longer than wide; coxopleura with sparse pores; legs of the ultimate pair with claw-like pretarsus. See Table 4.

Table 4. Differences between species of the genus *Pachymerium* C.L. Koch, 1847 known from Asian Russia.

Species	Characters			
	Chitin-lines	Denticle on forcipular tarsungulum	Leg-bearing segments	Ultimate metasternite: lateral margins
P. ferrugineum (C.L. Koch, 1835)	extending for most part of the length of the coxosternite	yes	41–69	distinctly converging posteriorly
P. pilosum (Meinert, 1870)	very short	no	45–49	subparallel

11. *Pachymerium ferrugineum* (C.L. Koch, 1835)

Geophilus ferrugineus – Sseliwanoff 1884: 77.

Pachymerium ferrugineum – Titova 1969: 166; Zalesskaja et al. 1982: 187; Ganin 1997: 105, 112, 116, 146; Farzalieva 2008: 61; Sergeeva 2013: 530; Zuev 2016: 36; Zuev and Evsyukov 2016: 424; Bukhkalo et al. 2014: 73; Volkova 2016: 673; Dyachkov 2018a: 252; Nefediev et al. 2017a: 11; Dyachkov and Tuf 2019: 26; Dyachkov 2020: 79; 2022: 71; 2023: 1077; Dyachkov and Nedoev 2021: 42; Dyachkov et al. 2022: 73; 2023: 63; Dyachkov and Farzalieva 2023: 228.

Type locality. GERMANY: Arklee, near Regensburg (Bonato and Minelli 2014).

Diagnosis. A species of *Pachymerium* with two paired clypeal areas; forcipular coxosternite with chitin-lines, which extend for most part of the length of the coxosternite, but do not reach the anterior margin; both forcipular trochanteroprefemur and tarsungulum with relatively small denticles; 41–69 leg-bearing segments; ventral pore-fields present, also on the posterior part of the trunk,

where they are reduced to two paired posterior groups on each metasternite; ultimate metasternite trapezoidal, approximately as long as wide, distinctly tapering towards the posterior margin; all coxal pores sparse from the ventral to the dorsal sides of the coxopleura.

Distribution. Western Siberia: Chelyabinsk, Sverdlovsk, Tyumen, and Tomsk oblasts, Altai krai (Zalesskaja et al. 1982; Farzalieva 2008; Sergeeva 2013; Bukhkalo et al. 2014; Nefediev et al. 2017a). Far East: Amur oblast, Jewish autonomous oblast, and Maritime krai (Zalesskaja et al. 1982; Ganin 1997). Outside Asian Russia: Western Palaearctic.

12. *Pachymerium pilosum* (Meinert, 1870) *

Geophilus pilosus Meinert 1870: 86.
Geophilus pilosus – Stuxberg 1876a: 32; 1876b: 315; Sseliwanoff 1881: 3; 1884: 76; Daday 1889: 146; Attems 1929: 324.
Geophilus (*Pachymerium*) *pilosus* – Attems 1903a: 45; 1903b: 257.
Pachymerium pilosum – Muralewicz 1926: 42; Bonato et al. 2016.

Type locality. Russia: Sakhalin oblast: "Sartung, paa Oen Sacolin" (Meinert 1870) = "Sartung" (see Remarks), Sakhalin Isl.

Type series. *Syntypes*: 2 specimens, both sexes. Deposited in NHMD.

Diagnosis. A species of *Pachymerium* with forcipular coxosternite with very short chitin-lines; forcipular tarsungulum without denticle; 45–49 leg-bearing segments; ultimate metasternite narrow, with subparallel lateral edges; all coxal pores sparse from the ventral to the dorsal sides of the coxopleura.

Distribution. Eastern Siberia: Krasnoyarsk krai, Irkutsk oblast (Stuxberg 1876a, 1876b; Sseliwanoff 1881, 1884; Daday 1889). Far East: Sakhalin oblast (Sakhalin Isl.) (Meinert 1870). Outside Asian Russia: no records.

Remarks. Sseliwanoff (1884) reported specimens from "near Baikal", collected by G. Dybovskiy. According to the catalogue of Chilopoda of the ZMMU, these specimens were collected from the Kultuk (urban-type settlement in the Irkutsk oblast, 51°43'N, 103°40'E).

The assignment of this nominal species to the genus *Pachymerium* is only tentative (Bonato et al. 2016), and is suggested only by the following few characters described by Meinert (1870): head ~ 1.2× as long as wide, forcipular coxosternite very broad and with two anterior denticles, forcipules surpassing the anterior margin of the head, coxopleura elongate and with dense coxal pores not only on the ventral side but also on the lateral and dorsal ones, ultimate legs slightly longer than penultimate legs and bearing a claw.

The current identity and position of the locality "Sartung" (indicated by Meinert 1870) is uncertain.

Genus *Strigamia* Gray, 1843

Diagnosis. Geophilids with head slightly wider or as wide as long; clypeal areas absent; labrum without obviously distinct lateral parts; second maxillary coxosternite medially long and sclerotized, without both statuminia and anterior

inner processes; second maxillary pretarsus relatively small, claw-like; forcipular tergite approximately as wide as the subsequent tergite, covering pleurites almost completely; forcipular coxosternite distinctly shorter than wide, without both anterior denticles and chitin-lines, with coxopleural sutures distinctly diverging also in their anterior half; forcipular trochanteroprefemur relatively stout, without denticle; forcipular tarsungulum with a relatively large basal denticle; trunk sternites without "carpophagus" structures; ventral pore-fields present, at least two paired ovoid posterior fields on each metasternite; coxal pores only on the ventral side of coxopleura, denser near the metasternite; leg of the ultimate pair usually with claw-like pretarsus. See Table 5.

Table 5. Differences between species of the genus *Strigamia* Gray, 1843 known from Asian Russia.

Species	Characters							
	Head	Forcipular tarsungula			Anterior sternites	Number of leg-bearing segments	Ultimate leg-bearing segment	
	Clypeal setae	Surpassing the anterior margin of the head	Margins of intermediate part	Size of basal denticle	Mid-longitudinal sclerotized stripe		Intercalary pleurites	Metasternite
S. cf. *acuminata* (Leach, 1815)	three groups	no	variable	short	no	37–43	no	ca as long as wide
S. alokosternum (Attems, 1927)	?	no	subparallel	large	yes	51–67	yes	distinctly wider than long
S. hirsutipes (Attems, 1927)	?	no	gradually converging	short	?	39–53	yes	longer than wide
S. pusilla (Sseliwanoff, 1884)	?	no	gradually converging	short	no	33–39	yes	as long as wide or longer than wide
S. sacolinensis (Meinert, 1870)	?	yes	?	?	no	43–47	?	?
S. sibirica (Sseliwanoff, 1881)	?	no	?	?	?	33–35	?	?
S. sulcata (Sseliwanoff, 1881)	?	no	?	?	?	41–43	?	?
S. cf. *transsilvanica* (Verhoeff, 1928)	entire band	no	gradually converging	large	no	43–57	no	ca as long as wide

13. *Strigamia* cf. *acuminata* (Leach, 1815)

Scolioplanes acuminatus – Sseliwanoff 1881: 15; 1884: 92; Verhoeff 1928: 278; Attems 1929: 222; Takakuwa 1933: 133; 1938: 241; 1940: 124; Shinohara 1972: 66; Kurcheva 1977: 46.

Strigamia acuminata – Ganin 1997: 105, 112, 116, 129, 134, 141; Barber 2009: 74; Bonato et al. 2012: 9; 2023: 11; Volkova 2016: 675.

Type localities. United Kingdom: "Roborough Down near Plymouth" and "Battersea fields" (Leach 1815).

Diagnosis. A species of *Strigamia* with clypeal setae arranged in an intermediate and two lateral groups; forcipular tarsungula not surpassing the anterior margin of the head; basal denticle of forcipular tarsungulum relatively short and with straight converging margins; 37–43 leg-bearing segments; metasternites of the anterior part of the trunk without a mid-longitudinal sclerotized stripe; ultimate leg-bearing segment with pleuropretergite entire, i.e., without distinct intercalary pleurites, and metasternite approximately as long as wide.

Distribution. Far East: Amur oblast and Khabarovsk krai (Ganin 1997), Sakhalin oblast (Kuril Islands) (Takakuwa 1933; Kurcheva 1977). Outside Asian Russia: Europe (Barber 2009; Bonato et al. 2012, 2023; Volkova 2016).

Remarks. All records from Russian Far East need confirmation, as are the records from Japan and the Western part of North America, because of probable confusion with other species including *S. chionophila* Wood, 1862 (Bonato et al. 2012).

14. *Strigamia alokosternum* (Attems, 1927)

Scolioplanes alokosternum Attems 1927: 294.
Scolioplanes alokosternum – Attems 1929: 223; Takakuwa 1938: 243; 1940: 128; Kurcheva 1977: 45.
Strigamia alokosternum – Murakami 1993: 105; Bonato et al. 2012: 9.

Type localities. JAPAN: "Yamanaka, Suruga" and "Bukenji" (Attems 1927).

Type series. ***Syntypes***: 2 specimens, both sexes. Deposited in NHMW (Ilie et al. 2009).

Diagnosis. A species of *Strigamia* with forcipular tarsungula not surpassing the anterior margin of the head; basal denticle of forcipular tarsungulum relatively large; internal and external margins of forcipular tarsungulum subparallel in their intermediate part; 51–67 leg-bearing segments; metasternites of the anterior part of the trunk with a mid-longitudinal sclerotized stripe; ultimate leg-bearing segment with distinct intercalary pleurites, and metasternite distinctly wider than long.

Distribution. Far East: Sakhalin oblast (Sakhalin Isl.) (Kurcheva 1977). Outside Asian Russia: Korean Peninsula and Japan (Bonato et al. 2012).

15. *Strigamia hirsutipes* (Attems, 1927) *

Scolioplanes hirsutipes Attems 1927: 293.
Scolioplanes hirsutipes – Attems 1929: 222; Takakuwa 1938: 243; 1940: 127; Ghilarov and Perel 1973: 46; Kurcheva 1977: 45.
Strigamia hirsutipes – Ganin 1997: 124, 126, 128; Bonato et al. 2012: 15.

Type localities. JAPAN: "Kanagava", "Yamanaka (Suruga)", "Bukengi", and Negishi" (Attems 1927).

Type series. ***Syntypes*:** ca 42 specimens, both sexes. Deposited in NHMW (Ilie et al. 2009).

Diagnosis. A species of *Strigamia* with forcipular tarsungula not surpassing the anterior margin of the head; basal denticle of forcipular tarsungulum relatively short; internal and external margins of forcipular tarsungulum gradually converging through the entire length; 39–53 leg-bearing segments; ultimate leg-bearing segment with distinct intercalary pleurites and metasternite longer than wide.

Distribution. Far East: Maritime krai, Sakhalin oblast (Sakhalin Isl.) (Ghilarov and Perel 1973; Kurcheva 1977; Ganin 1997). Outside Asian Russia: Japan (Attems 1927; Bonato et al. 2012).

Remarks. The taxonomic distinction of this nominal species from *S. sacolinensis* is uncertain.

Records from South-Eastern Asia are doubtful (Bonato et al. 2012).

16. *Strigamia pusilla* (Sseliwanoff, 1884)

Scolioplanes pusillus Sseliwanoff 1884: 92.
Scolioplanes pusillus – Attems 1929: 224.
Scolioplanes perkeo Verhoeff 1935: 19 (synonymy by Dobroruka 1955: 202).
Scolioplanes pseudopusillus Loksa 1962: 857 (synonymy by Zalesskaja et al. 1982: 190).
Strigamia pusillus – Zalesskaja et al. 1982: 189; Volkova 2016: 675.
Strigamia pusilla – Farzalieva 2008: 64; Bonato et al. 2012: 18; Tuf and Kupka 2015: 110; Poloczek et al. 2016: 117; Tuf and Tajovsky 2016: 47; Nefediev et al. 2017c: 223; 2018: 237; Nefediev 2019: 25; Dyachkov and Farzalieva 2023: 229.

Type locality. Russia: Moscow oblast: "Zaraysk, Ryazanskoy Gubernii" (Sseliwanoff 1884) = Zaraysk city, 54°45'N, 38°53'E.

Type series. ***Syntypes***: 11 specimens, including 4 males and 7 females. Deposited in ZISP.

Diagnosis. A species of *Strigamia* with forcipular tarsungula not surpassing the anterior margin of the head; basal denticle of forcipular tarsungulum relatively short, pointed, and with straight outlines; internal and external margins of forcipular tarsungulum gradually converging through the entire length; 33–39 leg-bearing segments; metasternites of the anterior part of the trunk without a mid-longitudinal sclerotized stripe; ultimate leg-bearing segment with distinct intercalary pleurites and metasternite as long as wide or longer than wide.

Distribution. Western Siberia: Sverdlovsk oblast (Zalesskaja et al. 1982; Farzalieva 2008), Altai krai (Nefediev et al. 2018; Nefediev 2019), and Republic of Altai (Nefediev et al. 2017c). Eastern Siberia: Republic of Sakha (Yakutia) (Nefediev 2019). Outside Asian Russia: westwards to Central Europe (Zalesskaja et al. 1982; Bonato et al. 2012; Tuf and Tajovsky 2016; Volkova 2016), and southwards to Northern Mongolia (Poloczek et al. 2016; Dyachkov and Farzalieva 2023).

17. *Strigamia sacolinensis* (Meinert, 1870) *

Scolioplanes sacolinensis Meinert 1870: 53.
Scolioplanes sacolinensis – Sseliwanoff 1881: 16; 1884: 93; Attems 1903a: 46; 1903b: 267; 1929: 224; Molodova 1973: 67; Kurcheva 1977: 46.
Strigamia sacolinensis – Ganin 1997: 134; Bonato et al. 2012: 18.

Type locality. Russia: Sakhalin oblast: "Sartung paa Oen Sacalin" (Meinert 1870) = "Sartung" (see Remarks), Sakhalin Isl.

Type series. ***Holotype*:** female. Deposited in NHMD.

Diagnosis. A species of *Strigamia* with forcipular tarsungula surpassing the anterior margin of the head; 43–47 leg-bearing segments; metasternites of the anterior part of the trunk without a mid-longitudinal sclerotized stripe.

Distribution. Far East: Khabarovsk krai (Sseliwanoff 1881, 1884) and Sakhalin oblast (Sakhalin Isl.) (Meinert 1870; Molodova 1973; Kurcheva 1977; Ganin 1997). Outside Asian Russia: no records.

Remarks. Bonato et al. (2012) suggested the putative projection of the forcipules in front of the anterior margin of the head can be due to some post-mortem displacement of the head with respect to the trunk. Based on the incomplete description provided by Meinert (1870), this nominal species could be a senior synonym of either *S. hirsutipes* or *S. japonica* (Verhoeff, 1935).

The current identity and position of the locality "Sartung" (indicated by Meinert 1870) is uncertain.

18. *Strigamia sibirica* (Sseliwanoff, 1881) *

Scolioplanes sibiricus Sseliwanoff 1881: 16.
Scolioplanes sibiricus – Sseliwanoff 1884: 94; Attems 1903a: 46; 1903b: 268; 1929: 224.
Linotaenia sibirica – Cook 1896: 866.
Strigamia sibirica – Bonato et al. 2012: 18.

Type locality. Russia: Zabaykalsky krai: "Yablonoviy Khrebet" (Sseliwanoff 1881) = Yablonoviy Mt. Range, ca 52°2'N, 113°35'E.

Type series. *Syntypes*: 4 specimens, including 1 male and 3 females. Deposited in ZISP.

Diagnosis. A species of *Strigamia* with forcipular tarsungula not surpassing the anterior margin of the head; 33–35 leg-bearing segments.

Distribution. Eastern Siberia: Zabaykalsky krai (Sseliwanoff 1881). Outside Asian Russia: no records.

Remarks. The distinction between this nominal species and *S. pusilla* is unclear (Bonato et al. 2012).

19. *Strigamia sulcata* (Sseliwanoff, 1881) *

Scolioplanes sulcatus Sseliwanoff 1881: 17.
Scolioplanes sulcatus – Sseliwanoff 1884: 95; Attems 1903a: 46; 1903b: 267; 1929: 224.
Linotaenia sulcata – Cook 1896: 866.
Strigamia sulcatus – Ganin 1997: 114, 141.
Strigamia sulcata – Bonato et al. 2012: 19.

Type locality. Russia: Khabarovsk krai: "Nikolaevsk-na-Amure" (Sseliwanoff 1881) = Nikolayevsk-on-Amur city, 53°8'N, 140°42'E.

Type series. *Syntypes*: 3 specimens, including 2 males and 1 female. Deposited in ZISP.

Diagnosis. A species of *Strigamia* with forcipular tarsungula not surpassing the anterior margin of the head; 41–43 leg-bearing segments.

Distribution. Far East: Khabarovsk krai (Sseliwanoff 1881, 1884; Ganin 1997). Outside Asian Russia: no records.

Remarks. The distinction between this nominal species and many other congeneric species is unclear (Bonato et al. 2012).

20. *Strigamia* cf. *transsilvanica* (Verhoeff, 1928)

Scolioplanes transsilvanicus Verhoeff 1928: 278.
Scolioplanes transsilvanicus – Takakuwa 1938: 240; 1940: 123; Kurcheva 1977: 45.
Strigamia transsilvanicus – Ganin 1997: 121, 126.
Strigamia transsilvanica – Bonato et al. 2012: 19; 2023: 17.
Strigamia cf. *transsilvanica* – Zuev and Evsyukov 2016: 425; Nefediev et al. 2018: 237; Dyachkov 2018b: 255; Dyachkov et al. 2022: 75; Dyachkov and Zuev 2023: 159.

Type localities. Romania: "Hermannstadt" = Sibiu. Slovenia: "Gottschee" = Kocevje. Austria: "Ostalpen" = Eastern Alps; "Hermagor"; "Arlberg". Italy: "Schneelagern am Schlüsseljoch beim Brenner" = Colle della Chiave, near Brenero. Slovakia: "Tatra-Höhlenhain" = Tatranska Kotlina. Germany: "Titisee". Switzerland: "Pilatus Kulm" (Verhoeff 1928).

Diagnosis. A species of *Strigamia* with clypeal setae uniformly spaced in a continuous array, without recognizable gaps between intermediate and lateral groups of setae; forcipular tarsungula not surpassing the anterior margin of the head; basal denticle of forcipular tarsungulum relatively large and with distinctly curved outlines; internal and external margins of forcipular tarsungulum gradually converging through the entire length; 43–57 leg-bearing segments; metasternites of the anterior part of the trunk without a mid-longitudinal sclerotized stripe; ultimate leg-bearing segment with pleuropretergite entire, i.e., without distinct intercalary pleurites, and metasternite approximately as long as wide.

Distribution. Western Siberia: Altai krai (Nefediev et al. 2018). Far East: Maritime krai, Sakhalin oblast (Sakhalin Isl.) (Kurcheva 1977; Ganin 1997). Outside Asian Russia: westwards to Central Europe (Iorio 2005; Reip and Voigtländer 2009).

Remarks. *Strigamia transsilvanica* belongs to a species complex whose taxonomy is only partially resolved (Bonato et al. 2023).

Bonato et al. (2012) suggested that the records from Russian Far East are probably due to misidentification of a different species. Nefediev et al. (2018) suggested the presence of a possible undescribed species similar in morphology to *S. transsilvanica* from Western Siberia, so that also the presence of *S. transsilvanica* in Western Siberia is doubtful. Doubtful are also the records from European Russia and Caucasus (Zuev and Evsyukov 2016; Dyachkov et al. 2022; Dyachkov and Zuev 2023), Eastern Kazakhstan (Dyachkov 2018b), Japan, and Taiwan (Bonato et al. 2012).

Family Mecistocephalidae Bollman, 1893

Genus *Agnostrup* Foddai, Bonato, Pereira & Minelli, 2003

Diagnosis. Mecistocephalids with head moderately longer than wide; two clypeal plagulae, separated by a mid-longitudinal areolate stripe and extending to the lateral margins of the clypeus; cephalic pleurites without both spiculum and setae; first maxillary coxosternite medially divided by a sulcus, without

antero-lateral corners; second maxillary coxosternite medially undivided, with the grooves from the metameric pores reaching the posterior corners; second maxillary telopodites relatively small, not distinctly overreaching the first maxillary telopodites, without pretarsus; forcipular tergite distinctly wider than long, without a distinct mid-longitudinal sulcus; forcipular trochanteroprefemur with only a distal denticle, tarsungulum with a basal denticle; invariably 41 leg-bearing segments; sternites with non-furcate mid-longitudinal sulcus and without pore-fields; legs of the ultimate pair ending with a short spine. See Table 6.

Table 6. Differences between members of the family Mecistocephalidae Bollman, 1893 known from Asian Russia.

Species	Characters						
	Clypeal plagulae	First maxillary coxosternite: mid-longitudinal sulcus	Second maxillary telopodites surpassing first maxillary telopodites	Second maxillary pretarsus	Denticle on forcipular tarsingulum	Denticles on forcipular intermediate articles	Leg-bearing segments
Agnostrup striganovae (Titova, 1975)	two, extending to lateral margins of clypeus	yes	no	no	yes	small bulges	41
Arrup dentatus (Takakuwa, 1934)	two, not extending to lateral margins of clypeus	no	no	yes	yes	large on tibia	41
Arrup mamaevi (Titova, 1975)	two, not extending to lateral margins of clypeus	no	no	no	yes	small bulges	41
Tygarrup javanicus Attems, 1929	single, extending to lateral margins of clypeus	yes	yes	yes	no	tibia with denticle	45

21. *Agnostrup striganovae* (Titova, 1975)

Krateraspis striganovae Titova 1975: 40.
Krateraspis striganovae – Markelov and Mineeva 1981: 130; Ganin 1997: 124; 2011: 341.
Agnostrup striganovae – Foddai et al. 2003: 1254.

Type locality. Russia: Maritime krai: "Sudzuhinsky Zapovednik, Tachingauz" (Titova 1975) = Lazovsky Nature Reserve, Tachingauz bay, ca 43°1'N, 134°8'E.

Type series. *Holotype*: male. Deposited in ZMMU (S. Golovatch and A. Schileyko, pers. comm., 13.II.2023 and XII.2023).

Diagnosis. An *Agnostrup* species with body length reaching ≥ 3 cm; clypeal plagulae with an irregular anterior margin and slightly smaller than the areolate part of the clypeus; many setae near the anterior margin of plagulae and on the center of the areolate part of the clypeus; forcipular trochanteroprefemur 1.3× as long as wide, both forcipular femur and tibia with small bulges.

Distribution. Far East: Maritime krai (Titova 1975; Markelov and Mineeva 1981; Ganin 1997). Outside Asian Russia: no records.

Genus *Arrup* Chamberlin, 1912

Diagnosis. Mecistocephalids with head moderately longer than wide; two clypeal plagulae, separated by a mid-longitudinal areolate stripe and not extending to the lateral margins of the clypeus; cephalic pleurites without both spiculum and setae; first maxillary coxosternite medially undivided, without

antero-lateral corners; second maxillary coxosternite medially undivided, with the grooves from the metameric pores reaching the posterior corners; second maxillary telopodites relatively small, not distinctly overreaching the first maxillary telopodites, usually without pretarsus; forcipular tergite distinctly wider than long, without a distinct mid-longitudinal sulcus; forcipular trochanteroprefemur with only a distal denticle, tarsungulum with a basal denticle; invariably 41 leg-bearing segments; sternites with non-furcate mid-longitudinal sulcus and without pore-fields; legs of the ultimate pair ending with a short spine. See Table 6.

22. *Arrup dentatus* (Takakuwa, 1934)

Prolamnonyx dentatus Takakuwa 1934a: 707 (see Remarks).
Prolamnonyx dentatus – Takakuwa 1934b: 359; 1934c: 883.
Prolamnonyx dentatus – Shinohara 1972: 66; Titova 1975: 45; Ganin 1997: 134.
Arrup dentatus – Crabill 1964: 166; Foddai et al. 2003: 1261; Uliana et al. 2007: 13.

Type locality. JAPAN: Hokkaido: "Zyôzankei (bei Sapporo)" (Takakuwa 1934b).

Type series. Unknown number of specimens, possibly lost (Jonishi and Nakano 2022). Depositary unknown.

Diagnosis. An *Arrup* species with body reaching ≥ 2 cm; second maxillary pretarsi present (see Remarks); forcipular trochanteroprefemur with a large distal denticle, tibia with large denticle, tarsungulum with pointed basal denticle.

Distribution. Far East: Maritime krai, Sakhalin oblast (Sakhalin and Kuril Islands: Shikotan) (Titova 1975; Ganin 1997). Outside Asian Russia: Japan (Takakuwa 1934b; Shinohara 1972).

Remarks. The name *Prolamnonyx dentatus* was validly introduced by Takakuwa (1934a) in a key; specimens were later described in more detail by Takakuwa (1934b, 1934c). Uliana et al. (2007) described the presence of second maxillary pretarsi in this species, according to the original description and Titova (1975), it is absent in this species.

23. *Arrup mamaevi* (Titova, 1975)

Prolamnonyx mamaevi Titova 1975: 44.
Prolamnonyx holstii – Titova 1969: 165 (see Remarks).
Prolamnonyx mamaevi – Ganin 1997: 121.
Arrup mamaevi – Foddai et al. 2003: 1262.

Type locality. RUSSIA: Maritime krai: "Primorsky Kray, zapovednik Kedrovaya Pad", Kedrovaya Pad Nature Reserve, ca 43°05'N, 131°30'E, (Titova 1975).

Type series. ***Holotype*:** female. Deposited in ZMMU (S. Golovatch and A. Schileyko, pers. comm., 13.II.2023 and XII.2023).

Diagnosis. An *Arrup* species with body length reaching ≥ 3 cm; second maxillary pretarsi absent; forcipular trochanteroprefemur with a large distal denticle, both femur and tibia with small bulges, tarsungulum with pointed basal denticle.

Distribution. Far East: Maritime krai (Titova 1975; Ganin 1997). Outside Asian Russia: no records.

Remarks. The holotype had been previously assigned to *Prolamnonyx holstii* (Pocock, 1895) by Titova (1969).

Genus *Tygarrup* Chamberlin, 1914

Diagnosis. Mecistocephalids with head distinctly longer than wide; clypeus with an entire plagula, without mid-longitudinal areolate stripe and extending to the lateral margins of the clypeus; cephalic pleurites without both spiculum and setae; first maxillary coxosternite medially divided by a sulcus, without antero-lateral corners; second maxillary coxosternite medially undivided, with the grooves from the metameric pores reaching the lateral margins; second maxillary telopodites distinctly overreaching the first maxillary telopodites, with claw-like pretarsus; forcipular tergite only slightly wider than long, without a distinct mid-longitudinal sulcus; forcipular trochanteroprefemur with only a distal denticle, tarsungulum without denticle; invariably 43 or 45 leg-bearing segments; sternites with non-furcate mid-longitudinal sulcus and sometimes with pore-fields; legs of the ultimate pair ending with a short spine. See Table 6.

24. *Tygarrup javanicus* Attems, 1929

Tygarrup javanicus Attems 1929: 152.
Tygarrup javanicus – Bonato et al. 2004; Nefediev 2019: 24; Tuf et al. 2018: 560; Damasiewicz and Leśniewska 2020: 52; Gilgado et al. 2022: 92.

Type localities. Indonesia: Java: “Buitenzorg”, “Tjibodas” and “Tjompea” (Attems 1929).

Diagnosis. A *Tygarrup* species with body length ≤ 2 cm; no distinct dark patches along the body; second maxillary pretarsus with a long slender point; both forcipular trochanteroprefemur and tibia with denticles; invariably 45 leg-bearing segments; ventral pore-fields absent in females, present in males; metasternite of the ultimate leg-bearing segment slightly wider than long.

Distribution. Western Siberia: Altai krai (Nefediev 2019). Outside Asian Russia: Southeast Asia and introduced in Europe (e.g., Bonato et al. 2004; Tuf et al. 2018; Damasiewicz and Leśniewska 2020; Gilgado et al. 2022).

Remarks. The species is regarded as an anthropochore introduction in Asian Russia (Nefediev 2019).

Family Schendylidae Cook, 1896

Genus *Escaryus* Cook & Collins, 1891

Diagnosis. Schendylids with head slightly longer than wide; antennae gradually tapering; labrum with distinct denticles in the intermediate part; first maxillae with lappets; second maxillary pretarsi fringed by two rows of filaments;

forcipular tergite narrower than subsequent tergite; ventral pore-fields absent; coxal pores numerous and scattered; legs of the ultimate pair with two tarsal articles and claw-like pretarsus, swollen in adult males and slender in females; gonopods biarticulated in both sexes. See Table 7.

25. *Escaryus chadaevae* Titova, 1973

Escaryus chadaevae Titova 1973: 105.
Escaryus chadaevae – Rybalov 2002: 83; Vorobiova et al. 2002: 62; Poloczek et al. 2016: 117; Volkova 2016: 675; Nefediev et al. 2017c: 221; Dyachkov and Farzalieva 2023: 229.

Type localities. Russia: Kemerovo oblast: "Prokopyevsky i Novokuznetsky r-ny" (Titova 1973) = Prokopyevsky, ca 53°53'N, 86°43'E, and Novokuznetsky, ca 53°45'N, 87°07'E, districts.

Type series. *Holotype*: female. Paratypes: 10 specimens, including 5 males and 5 females. Deposited in ZMMU (S. Golovatch and A. Schileyko, pers. comm., 13.II.2023 and XII.2023).

Table 7. Differences between species of the genus *Escaryus* Cook & Collins, 1891 known from Asian Russia.

Species	Characters									
	Labrum		First maxillae: pairs of lappets	Denticles on forcipular articles				Leg-bearing segments	Ultimate leg-bearing segment: metasternite: shape, length/ width	Anal pores
	Margin	Denticles		Trochantero-prefemur	Femur	Tibia	Tarsungulum			
E. chadaevae Titova, 1973	shallow	short and obtuse	1	small bulge	small bulge	large bulge	large denticle	33–35	trapezoid, < 1	absent
E. chichibuensis Shinohara, 1955	shallow	short and obtuse	1	small bulge	small bulge	small bulge	no	35–39	trapezoid, ~ 1	present
E. dentatus Titova, 1973	shallow	short and obtuse	1	large	small	small	large	37–39	trapezoid, > 1	present
E. hirsutus Titova 1973	deep	long and obtuse	1	large bulge	large bulge	large bulge	large bulge	37–39	rectangular, 1.5	present
E. japonicus Attems, 1927	shallow	long and obtuse	1	small	small bulge	small bulge	small bulge	43–55	rectangular, 2	present
E. koreanus Takakuwa, 1937	shallow	long, middle denticles obtuse, lateral ones pointed	1	small	no	no	small bulge	43–55	rectangular, 2	present
E. krivolutskiji Titova, 1973	deep	short and obtuse	1	large bulge	small bulge	large bulge	small bulge	45–49	trapezoid, ~ 1	present
E. molodovae Titova, 1973	shallow	short and obtuse	1	small	small	small	large	35	trapezoid, ~ 1	present
E. perelae Titova, 1973	shallow	short and obtuse	1	small	no	small	large	39–43	trapezoid, < 1	present
E. polygonatus Titova, 1973	deep	short and obtuse	1	small bulge	small bulge	small bulge	no	39	trapezoid, 1.5	present
E. retusidens Attems, 1904	deep	long and obtuse	1	small	small	small	small bulge	49–55	trapezoid, ~ 1	absent
E. sachalinus Takakuwa, 1935	deep	short and obtuse	?	small	small	small	no	35–39	rectangular, 1.5	present
E. sibiricus Cook, 1899	shallow	middle denticles obtuse, lateral ones long and pointed	2	small bulge	no	no	no	49–51	rectangular, 2	absent
E. vitimicus Titova, 1973	shallow	long and obtuse	1	small bulge	small bulge	small bulge	small bulge	37	rectangular, 1.5	present

Diagnosis. An *Escaryus* species with body length reaching ≥ 1.5 cm; clypeus without plagulae; labral arc relatively shallow, with denticles short and obtuse; first maxillae with one pair of lappets; forcipular trochanteroprefemur and femur with small bulges, tibia with a large bulge, tarsungulum with a large basal denticle; 33–35 leg-bearing segments; metasternite of the ultimate leg-bearing segment trapezoid, distinctly wider than long; coxal pores only on the ventral side of coxopleura; anal pores absent.

Distribution. Western Siberia: Kemerovo oblast, Republic of Altai (Titova 1973; Nefediev et al. 2017c). Eastern Siberia: Krasnoyarsk krai (Rybalov 2002; Vorobiova et al. 2002). Outside Asian Russia: European Russia (Republic of Bashkortostan) (Titova 1973; Volkova 2016), and Northern Mongolia (Poloczek et al. 2016; Dyachkov and Farzalieva 2023).

26. *Escaryus chichibuensis* Shinohara, 1955 *

Escaryus chichibuensis Shinohara 1955: 59.
Escaryus chichibuensis – Titova 1973: 114; Kurcheva 1977: 45.

Type localities. Japan: Honshu: Saitama Prefecture: "Chichibu (Mt. Kumotori, Kasatori pass, Mt. Kobushi, Kabagoya-ato, Karisaka pass, Jumonji pass, Mt. Shiraiwa, Mt. Mae-Shiraiwa" (Shinohara 1955).

Type series. *Syntypes*: unknown number of specimens, both sexes. Depository unknown.

Diagnosis. An *Escaryus* species with body length reaching ≥ 2 cm; clypeus with small plagulae; labral arc relatively shallow, with denticles short and obtuse; first maxillae with one pair of lappets; forcipular trochanteroprefemur, femur, and tibia with small bulges, tarsungulum without bulge; 35–39 leg-bearing segments; metasternites with relatively sparse setae; metasternite of the ultimate leg-bearing segment trapezoid, approximately as long as wide; coxal pores on both ventral and lateral sides of coxopleura; anal pores present.

Distribution. Far East: Sakhalin oblast (Kuril Islands: Kunashir and Shikotan) (Titova 1973; Kurcheva 1977). Outside Asian Russia: Japan (Shinohara 1955).

27. *Escaryus dentatus* Titova, 1973 *

Escaryus dentatus Titova 1973: 99.
Escaryus dentatus – Kurcheva 1977: 45; Markelov and Mineeva 1981: 130; Ganin 1997: 121, 124, 126, 128; 2006: 501.

Type localities. Russia: Maritime krai: "Suputinsky zapovednik" = Ussuriysky Nature Reserve, ca 43°40'N, 132°32'E, and "Kedrovaya Pad" (both Titova 1973) = Kedrovaya Pad Nature Reserve, ca 43°05'N, 131°30'E, (see Remarks).

Type series. *Holotype*: female. Paratypes: 11 specimens, including 6 males and 5 females. Deposited in ZMMU (S. Golovatch and A. Schileyko, pers. comm., 13.II.2023 and XII.2023).

Diagnosis. An *Escaryus* species with body length reaching ≥ 2 cm; clypeus without plagulae (polygonal structure poorly visible, but recognizable); labral

arc relatively shallow, with denticles short and obtuse; first maxillae with one pair of lappets; forcipular trochanteroprefemur and tarsungulum with large denticles, femur and tibia with small denticles; 37–39 leg-bearing segments; metasternites with relatively sparse setae; metasternite of the ultimate leg-bearing segment trapezoid, slightly longer than wide; coxal pores on both ventral and lateral sides of coxopleura; anal pores present.

Distribution. Far East: Maritime krai (Titova 1973; Kurcheva 1977; Ganin 1997, 2006). Outside Asian Russia: no records.

Remarks. Titova (1973) indicated that the type series was from two localities ("Suputinsky zapovednik" and "Kedrovaya Pad"), but she did not state explicitly which is the locality of the holotype.

28. *Escaryus hirsutus* Titova 1973 *

Escaryus hirsutus Titova 1973: 96.
Escaryus hirsutus – Molodova 1973: 67; Kurcheva 1977: 45; Ganin 1997: 134.

Type locality. Russia: Sakhalin oblast: "O-v Sakhalin, Yuzhno-Sakhalinsk, gora Chekhova" (Titova 1973) = Chekhova Mt., near Yuzhno-Sakhalinsk city, ca 47°00'N, 142°50'E.

Type series. Holotype: female. Paratypes: 10 specimens, including 5 males and 5 females. Deposited in ZMMU (S. Golovatch and A. Schileyko, pers. comm., 13.II.2023 and XII.2023).

Diagnosis. An *Escaryus* species with body length reaching ≥ 2.5 cm; clypeus with large plagulae; labral arc relatively deep, with denticles long and obtuse; first maxillae with one pair of lappets; all forcipular articles with large bulges; 37–39 leg-bearing segments; metasternites with relatively dense setae; metasternite of the ultimate leg-bearing segment almost rectangular, ~ 1.5× as long as wide; coxal pores on both ventral and lateral sides of coxopleura; anal pores present.

Distribution. Far East: Sakhalin oblast (Sakhalin Isl.) (Titova 1973; Molodova 1973; Kurcheva 1977; Ganin 1997). Outside Asian Russia: no records.

29. *Escaryus japonicus* Attems, 1927 *

Escaryus japonicus Attems 1927: 299.
Escaryus japonicus – Attems 1929: 96; Byzova and Chadaeva 1965: 333; Shinohara 1972: 66; Titova 1969: 165; 1972: 135; 1973: 113; Ghilarov and Perel 1973: 46; Molodova 1973: 67; Alekseeva 1974: 8; Kurcheva 1977: 45; Markelov and Mineeva 1981: 130; Ganin 1997: 105, 109, 112, 114, 121, 124, 126, 129, 134, 141; 2006: 501; Vorobiova 1999: 33; Farzalieva 2008: 67; Volkova 2016: 676; Dyachkov 2017: 454; Nefediev et al. 2017a: 11; 2017c: 222; Dyachkov and Tuf 2018: 296; Nefediev 2019: 25; Dyachkov and Farzalieva 2023: 229.

Type locality. Japan: Hokkaido: "Todohokhe" (Attems 1927).

Type series. *Syntypes*: 2 specimens, including a male and a juvenile. Deposited in NHMW (Ilie et al. 2009).

Diagnosis. An *Escaryus* species with body length reaching ≥ 4.3 cm; clypeus with large plagulae; labral arc relatively shallow, with denticles long and obtuse; first maxillae with one pair of lappets; forcipular trochanteroprefemur with a small distal denticle, all other articles with very small bulges; 43–55 leg-bearing segments; metasternites with relatively sparse setae; metasternite of the ultimate leg-bearing segment rectangular, ~ 2× as long as wide; coxal pores of similar size, on both ventral and lateral sides of coxopleura; anal pores present.

Distribution. Western Siberia: Sverdlovsk, Chelyabinsk, Tomsk, and Kemerovo oblasts, republics of Altai and Khakassia (Byzova and Chadaeva 1965; Titova 1972, 1973; Farzalieva 2008; Dyachkov 2017; Nefediev et al. 2017a, 2017c; Nefediev 2019). Eastern Siberia: Republic of Buryatia and Krasnoyarsk krai (Alekseeva 1974; Titova 1973; Vorobiova 1999), Magadan oblast (Berman and Leirikh 2019). Far East: Amur oblast, Maritime and Khabarovsk krais, Sakhalin oblast (Sakhalin Isl.) (Titova 1973; Ghilarov and Perel 1973; Molodova 1973; Kurcheva 1977; Markelov and Mineeva 1981; Ganin 1997, 2006). Outside Asian Russia: European Russia (Titova 1973; Farzalieva 2008; Volkova 2016), eastern Kazakhstan (Dyachkov and Tuf 2018), Mongolia (Dyachkov and Farzalieva 2023), Northern China (Takakuwa and Takashima 1949), and Japan (Attems 1927).

Remarks. The record from the Krasnoyarsk krai by Vorobiova (1999) was questioned by Nefediev et al. (2017a).

30. *Escaryus koreanus* Takakuwa, 1937 *

Escaryus koreanus Takakuwa 1937a: 297.

Escaryus koreanus – Takakuwa 1940: 39; Titova 1972: 135; 1973: 112; Ghilarov and Perel 1973: 46; Kurcheva 1977: 45; Ganin 1997: 105, 109, 112, 114, 121, 124, 126, 128; 2006: 501; Rybalov 2002: 83; Vorobiova et al. 2002: 62; Nefediev et al. 2017a: 11; 2017c: 222; 2018: 238; Dyachkov 2017: 454; Dyachkov and Tuf 2018: 296; Nefediev 2019: 26.

Type locality. North Korea: "Husenzan" (Takakuwa 1937a).

Type series. ***Syntypes*:** unknown number of specimens, both sexes. Depository unknown.

Diagnosis. An *Escaryus* species with body length reaching ≥ 6.5 cm; clypeus with large plagulae; labral arc relatively shallow, with long denticles, the middle denticles obtuse, the lateral ones pointed; first maxillae with one pair of lappets; forcipular trochanteroprefemur with an small obtuse denticle, femur and tibia without denticles, tarsungulum with a small basal bulge; 43–55 leg-bearing segments; metasternites with relatively dense setae; metasternite of the ultimate leg-bearing segment rectangular, ~ 2× as long as wide; coxal pores of different size, on both ventral and lateral sides of coxopleura, including a pair of much larger pores on each coxopleuron; anal pores present.

Distribution. Western Siberia: Altai krai, republics of Altai and Khakassia, Kemerovo, Novosibirsk, and Tomsk oblasts (Titova 1972, 1973; Dyachkov 2017; Nefediev et al. 2017a, 2017c, 2018; Nefediev 2019). Eastern Siberia: Krasnoyarsk krai, Irkutskaya oblast (Rybalov 2002; Vorobiova et al. 2002; Nefediev 2019). Far East: Maritime and Khabarovsk krais, Amur Oblast (Titova 1972,

1973; Ghilarov and Perel 1973; Kurcheva 1977; Ganin 1997). Outside Asian Russia: Eastern Kazakhstan (Dyachkov and Tuf 2018), Japan, and North Korea (Takakuwa 1937a, 1940).

Remarks. Titova (1973: 113) suggested that *E. koreanus* can be a junior synonym of *E. sibiricus* Cook, 1899.

31. *Escaryus krivolutskiji* Titova, 1973 *

Escaryus krivolutskiji Titova 1973: 102.
Escaryus krivolutskiji – Kurcheva 1977: 45; Markelov and Mineeva 1981: 129; Ganin 1997: 121, 124, 126, 128.

Type localities. Russia: Maritime krai: "Suputinsky zapovednik" = Ussuriysky Nature Reserve, ca 43°40'N, 132°32'E, and "Kangauz" = Anisimovka Village, ca 43°10'N, 132°47'E and "Kedrovaya Pad" = Kedrovaya Pad Nature Reserve, ca 43°05'N, 131°30'E, (all Titova 1973) (see Remarks).

Type series. ***Holotype*:** male. Paratypes: 10 specimens, including 5 males and 5 females. Deposited in ZMMU (S. Golovatch and A. Schileyko, pers. comm., 13.II.2023 and XII.2023).

Diagnosis. An *Escaryus* species with body length reaching ≥ 2 cm; clypeus without plagulae; labral arc relatively deep, with denticles short and obtuse; first maxillae with one pair of lappets; forcipular trochanteroprefemur and tibia with large bulges, femur and tarsungulum with small bulges; 45–49 leg-bearing segments; metasternite of the ultimate leg-bearing segment trapezoid, approximately as long as wide; coxal pores on both ventral and lateral sides of coxopleura, the pair of largest pores close to inner edge of coxopleura; anal pores present.

Distribution. Far East: Maritime krai (Titova 1973; Kurcheva 1977; Markelov and Mineeva 1981; Ganin 1997, 2006). Outside Asian Russia: no records.

Remarks. Titova (1973) indicated that the type series was from three localities ("Suputinsky zapovednik", "Kangauz", and "Kedrovaya Pad"), but she did not state explicitly which is the locality of the holotype.

32. *Escaryus molodovae* Titova, 1973 *

Escaryus molodovae Titova 1973: 95.
Escaryus molodovae – Molodova 1973: 67; Kurcheva 1977: 45; Ganin 1997: 134.

Type locality. Russia: Sakhalin oblast: "O-v Sakhalin, Yuzhno-Sakhalinsk, gora Chekhova" (Titova 1973) = Chekhova Mt., near Yuzhno-Sakhalinsk city, ca 47°0'N, 142°50'E.

Type series. ***Holotype*:** male. Paratypes: 8 specimens, including 5 males and 3 females. Deposited in ZMMU (S. Golovatch and A. Schileyko, pers. comm., 13.II.2023 and XII.2023).

Diagnosis. An *Escaryus* species with body length reaching ≥ 1.4 cm: clypeus with small plagulae; labral arc relatively shallow, with denticles short and obtuse; first maxillae with one pair of lappets; forcipular trochanteroprefemur,

femur and tibia with small denticles; forcipular tarsungulum with a large, pointed basal denticle; 35 leg-bearing segments; metasternites with relatively sparse setae; metasternite of the ultimate leg-bearing segment trapezoid, approximately as long as wide; coxal pores only on the ventral side of coxopleura; anal pores present.

Distribution. Far East: Sakhalin oblast (Sakhalin Isl.) (Titova 1973; Molodova 1973; Kurcheva 1977; Ganin 1997). Outside Asian Russia: no records.

33. *Escaryus perelae* Titova, 1973 *

Escaryus perelae Titova 1973: 101.
Escaryus perelae – Kurcheva 1977: 45; Markelov and Mineeva 1981: 129; Ganin 1997: 105, 109, 112, 121, 124, 126, 128; 2006: 501.

Type localities. Russia: Maritime krai: "Suputinsky zapovednik" = Ussuriysky Nature Reserve, ca 43°40'N, 132°32'E, and "Rayon r. Sinancha" = near Cheremukhovaya River, inflow of Dzhigitovka River, ca 44°50'N, 136°07'E (both Titova 1973) (see Remarks).

Type series. *Holotype*: female. Paratypes: 6 specimens, including 2 males and 4 females. Deposited in ZMMU (S. Golovatch and A. Schileyko, pers. comm., 13.II.2023 and XII.2023).

Diagnosis. An *Escaryus* species with body length reaching ≥ 2 cm; clypeus with small plagulae; labral arc relatively shallow, with denticles short and obtuse; first maxillae with one pair of lappets; forcipular trochanteroprefemur and tibia with small denticles, femur without denticle, tarsungulum with a large basal denticle; 39–43 leg-bearing segments; metasternite of the ultimate leg-bearing segment trapezoid, distinctly wider than long; most of coxal pores on the ventral side of coxopleura, mostly close to metasternite; anal pores present.

Distribution. Far East: Amur oblast, Maritime and Khabarovsk krais (Titova 1973; Kurcheva 1977; Markelov and Mineeva 1981; Ganin 1997, 2006). Outside Asian Russia: no records.

Remarks. Titova (1973) indicated that the type series was from two localities ("Suputinsky zapovednik" and "Rayon r. Sinancha"), but she did not state explicitly which is the locality of the holotype.

34. *Escaryus polygonatus* Titova, 1973 *

Escaryus polygonatus Titova 1973: 98.
Escaryus polygonatus – Kurcheva 1977: 45; Markelov and Mineeva 1981: 130; Ganin 1997: 121, 124, 126, 128; 2006: 501.

Type localities. Russia: Maritime krai: "Suputinsky zapovednik" = Ussuriysky Nature Reserve, ca 43°40'N, 132°32'E, and "Kedrovaya Pad" = Kedrovaya Pad Nature Reserve, ca 43°05'N, 131°30'E, (both Titova 1973).

Type series. *Holotype*: male. Paratypes: 17 specimens, including 9 males and 8 females. Deposited in ZMMU (S. Golovatch and A. Schileyko, pers. comm., 13.II.2023 and XII.2023).

Diagnosis. An *Escaryus* species with body length reaching ≥ 2.8 cm; clypeus with small plagulae; labral arc relatively deep, with denticles short and obtuse; first maxillae with one pair of lappets; forcipular trochanteroprefemur, femur, and tibia with small bulges; forcipular tarsungulum without denticle; 39 leg-bearing segments; metasternites with relatively sparse setae; metasternite of the ultimate leg-bearing segment trapezoid, ~ 1.5× as long as wide; coxal pores of different size, on both ventral and lateral sides of coxopleura; anal pores present.

Distribution. Far East: Maritime krai (Titova 1973; Kurcheva 1977; Markelov and Mineeva 1981; Ganin 1997). Outside Asian Russia: no records.

Remarks. Titova (1973) indicated that the type series was from two localities ("Suputinsky zapovednik" and "Kedrovaya Pad"), but she did not state explicitly which is the locality of the holotype.

35. *Escaryus retusidens* Attems, 1904

Escaryus retusidens Attems 1904: 121.

Escaryus retusidens – Attems 1929: 96; Titova 1972: 135, 116; 1973: 110; Volkova 2016: 675; Zuev 2016: 33; Nefediev et al. 2017a: 11; 2017c: 222; 2018: 239; Dyachkov and Tuf 2018: 295; Nefediev 2019: 27; Dyachkov 2022: 25.

Type locality. KYRGYZSTAN: Issyk-Kul Region: "Przewalsk" (Attems 1904) = Karakol.

Type series. *Syntypes*: 4 specimens, including 2 males and 2 females. Deposited in NHMW (Ilie et al. 2009).

Diagnosis. An *Escaryus* species with body length reaching ≥ 4 cm; clypeus with small plagulae; labral arc relatively deep, with denticles long and obtuse; first maxillae with one pair of lappets; forcipular trochanteroprefemur, femur, and tibia with small denticles, tarsungulum with a small bulge; 49–55 leg-bearing segments; metasternites with relatively sparse setae; metasternite of the ultimate leg-bearing segment trapezoid, approximately as long as wide; coxal pores on both ventral and lateral sides of coxopleura; anal pores absent.

Distribution. Western Siberia: Altai krai, Republic of Altai, and Kemerovo oblast (Nefediev et al. 2017a, 2017c, 2018; Nefediev 2019). Possibly Far East (Titova 1972, 1973; see Remarks). Outside Asian Russia: westwards to Moldova (Titova 1973; Volkova 2016; Zuev 2016; Zuev and Evsyukov 2016); southwards to Kazakhstan and Kyrgyzstan (Attems 1904; Titova 1972, 1973; Dyachkov and Tuf 2018; Dyachkov 2022).

Remarks. A total of 19 males and 26 females collected from Trans-Ili Alatau (Almaty Region of Kazakhstan) were indicated by Titova (1973: 110) as lectotypes, but this action is not valid, as the syntypes still exist (Ilie et al. 2009).

Titova (1972: 135; 1973: 116) wrote "... it is possible to distinguish territories from Cisamuria to Kuzbass and Altai, where 4 species are spread: *E. koreanus*, *E. japonicus*, *E. retusidens*, and *E. chadaevae*". However, she did not mention material from this area when she listed the studied material of *E. retusidens* (Titova 1973: 110): "Kazakhstan, Trans-Ili Alatau... Moreover, *E. retusidens* were studied from the Dzhungarian Alatau, the Greater Caucasus, Crimea, Moldova, Rostov, Voronezh and Voroshilovograd oblasts".

36. *Escaryus sachalinus* Takakuwa, 1935

Escaryus sachalinus Takakuwa 1935: 48.
Escaryus sachalinus – Titova 1969: 165; 1972: 135; 1973: 94, 118; Shinohara 1972: 66; Kurcheva 1977: 45.

Type localities. Russia: Sakhalin oblast: "Sachalin" = Sakhalin Isl. Japan: Hokkaido Isl.: "Sapporo" (both Takakuwa 1935).

Type series. *Syntypes*: 3 specimens. Depository unknown.

Diagnosis. An *Escaryus* species with body length reaching ≥ 3 cm; clypeus without plagulae; labral arc relatively deep, with denticles short and obtuse; first maxillae with lappets; all forcipular articles with small denticles, except tarsungulum; 35–39 leg-bearing segments; metasternite of the ultimate leg-bearing segment rectangular, ~ 1.5× as long as wide; numerous coxal pores on ventral side of coxopleuron; anal pores present.

Distribution. Far East: Sakhalin oblast (Sakhalin Isl.) (Titova 1973; Kurcheva 1977). Outside Asian Russia: Japan (Takakuwa 1935; Shinohara 1972) and northern China (Shinohara 1972).

37. *Escaryus sibiricus* Cook, 1899

Escaryus sibiricus Cook 1899: 304.
Escaryus sibiricus – Attems 1904: 122; 1927: 301; 1929: 95; Titova 1972: 135; 1973: 94, 113; Ganin 1997: 141; Thofern et al. 2021: 30.

Type locality. Russia: Maritime krai: "Vladivostock" (Cook 1899) = Vladivostok city, 43°7'N, 131°54'E.

Type series. *Syntypes*: 12 specimens, both sexes, including 10 specimens deposited in ZMH (Thofern et al. 2021) and 2 specimens deposited in NHMW (Ilie et al. 2009).

Diagnosis. An *Escaryus* species with body length reaching 6.5 cm; labral arc relatively shallow, with middle denticles obtuse and lateral ones long and pointed; first maxillae with two pairs of lappets; forcipular trochanteroprefemur with a small distal bulge, other forcipular articles without denticles; 49–51 leg-bearing segments; metasternite of the ultimate leg-bearing segment rectangular, ~ 2× as long as wide; coxal pores of different size, on both ventral and lateral sides, including a pair of much larger ventral pores on each coxopleuron; anal pores absent.

Distribution. Far East: Maritime krai (Cook 1899; Attems 1904) and Amur oblast (Ganin 1997). Outside Asian Russia: no records.

Remarks. Titova (1969) reported this species from Western Siberia (Kemerovo oblast) but later (Titova 1973) she regarded the same record as *E. koreanus*, even though she also suggested that the latter species can be a junior synonym of *E. sibiricus*. The anal pores were indicated as absent by Cook (1899) and Attems (1904) but illustrated as present in specimens identified as *E. sibiricus* by Thofern et al. (2021), and they are known to be present in *E. koreanus*.

38. *Escaryus vitimicus* Titova, 1973 *

Escaryus vitimicus Titova 1973: 103.
Escaryus vitimicus – Alekseeva 1974: 8.

Type locality. Russia: Republic of Buryatia: "r. Vitim, Aniboli" (Titova 1973) = ? Anibud river, inflow of Vitim River, ca 53°39'N, 113°53'E.

Type series. *Holotype*: female. Paratypes: 3 specimens, including 1 male and 2 females. Deposited in ZMMU (S. Golovatch and A. Schileyko, pers. comm., 13.II.2023 and XII.2023).

Diagnosis. An *Escaryus* species with body length reaching ≥ 2.7 cm; clypeus with large plagulae; labral arc relatively shallow, with denticles long and obtuse; first maxillae with one pair of lappets; all forcipular articles with small bulges; 37 leg-bearing segments; metasternites with relatively sparse setae; metasternite of the ultimate leg-bearing segment rectangular, ~ 1.5× as long as wide; coxal pores on both ventral and lateral sides of coxopleura, the largest pores near the metasternite; anal pores present.

Distribution. Eastern Siberia: Republic of Buryatia (Titova 1973; Alekseeva 1974). Outside Asian Russia: no records.

Other records of uncertain species

During ecological studies (Ghilarov and Perel 1973; Molodova 1973; Kurcheva 1977; Markelov and Mineeva 1981; Ganin 1997) some specimens of Geophilomorpha were not identified at the species level. These records are listed below.

Arctogeophilus sp. – Ghilarov and Perel 1973: 46 (Maritime krai); Markelov and Mineeva 1981: 130 (Maritime krai).
Geophilus sp. – Molodova 1973: 67 (Sakhalin oblast: Sakhalin Isl.); Ganin 1997: 105, 109, 112, 114, 128, 141 (Amur oblast and Khabarovsk krai); Markelov and Mineeva 1981: 130 (Maritime krai).
Pachymerium sp. – Kurcheva 1977: 46 (Khabarovsk and Maritime krais).
Scolioplanes sp. – Ghilarov and Perel 1973: 46 (Maritime krai); Alekseeva 1974: 8 (Republic of Buryatia); Markelov and Mineeva 1981: 130 (Maritime krai).
Strigamia sp. – Markelov and Mineeva 1981: 130 (Maritime krai).
Prolamnonyx sp. – Kurcheva 1977: 46 (Maritime krai and Sakhalin oblast: Kuril Islands).
Escaryus sp. – Markelov and Mineeva 1981: 129 (Maritime krai).

Discussion

History of studies

The first record of Geophilomorpha from Asian Russia was published by Gerstfeldt (1859), who recorded *Arthronomalus longicornis* Leach, 1815 (=*Geophilus flavus* (De Geer, 1778)) from the Zabaykalsky krai.

Other records of Geophilidae were provided by Meinert (1870), who described *Geophilus pilosus* from Sakhalin Isl., and by Stuxberg (1876a, 1876b),

who recorded the latter species in the Krasnoyarsk krai and also described *G. sibiricus* from this region. Around the same time Sseliwanoff (1881) described *G. orientalis* from the Khabarovsk krai, and recorded *G. pilosus* from the Krasnoyarsk krai and Irkutsk oblast, and *G. proximus* C.L. Koch, 1847 from Western Siberia. Attems (1909) described *Arctogeophilus glacialis* from three localities (two of them in the Chukotka Peninsula). Later, Verhoeff (1934) and Takakuwa (1937c) described *A. sachalinus*, *Geophilus bipartitus* and *G. rhomboideus* from Sakhalin Isl. Numerous faunistic and ecological studies (Byzova and Chadaeva 1965; Ghilarov and Perel 1973; Molodova 1973; Kurcheva 1977; Markelov and Mineeva 1981; Zalesskaja et al. 1982; Poryadina 1991; Striganova and Poryadina 2005; Ganin 1997, 2006; Vorobiova 1999; Vorobiova et al. 2002; Rybalov 2002; Farzalieva 2008; Sergeeva 2013; Bukhkalo and Sergeeva 2012; Bukhkalo et al. 2014; Nefediev et al. 2017a, 2017b, 2017c, 2018, 2021; Nefediev 2019) provided additional data for seven species of geophilids from Asian Russia: *Arctogeophilus macrocephalus* Folkmanová & Dobroruka, 1960, *Geophilus bipartitus*, *G. flavus*, *G. proximus*, *G. rhomboideus*, *G. sounkyoensis* Takakuwa, 1937, and *Pachymerium ferrugineum* (C.L. Koch, 1835).

The first record of *Strigamia* Gray, 1843 from Asian Russia was published by Meinert (1870), who described *Scolioplanes sacolinensis* from Sakhalin Isl. Later, Sseliwanoff (1881) described *S. sibiricus* from the Zabaykalsky krai and *S. sulcatus* from the Khabarovsk krai. A number of papers (Ghilarov and Perel 1973; Molodova 1973; Kurcheva 1977; Ganin 1997; Farzalieva 2008; Nefediev et al. 2017c, 2018; Nefediev 2019) provided other distribution data for seven *Strigamia* species from Asian Russia: *S. acuminata*, *S. alokosternum*, *S. hirsutipes*, *S. pusilla*, *S. sacolinensis*, *S. sulcata*, and *S. transsilvanica*.

The first record of the family Mecistocephalidae was published by Titova (1969), who reported a specimen from the Maritime krai, first as *Prolamnonyx holstii* (Pocock, 1895) and later (Titova 1975) as a new species, *Prolamnonyx mamaevi*. She also described *Krateraspis striganovae* from the Maritime krai and recorded *Prolamnonyx dentatus* from Far East. Markelov and Mineeva (1981) and Ganin (1997, 2011) published additional data for the species mentioned by Titova; Nefediev (2019) recorded an anthropochore introduction, *Tygarrup javanicus* Attems, 1929, in the Altai krai.

The first species of *Escaryus* Cook & Collins, 1891 (Schendylidae), *E. sibiricus*, was described by Cook (1899) from Vladivostok (Maritime krai). Later, Attems (1904) redescribed this species based on the type material, and Takakuwa (1935) described another species, *E. sachalinus*, from Sakhalin Isl. Eight other species of *Escaryus* were described by Titova (1973): *E. molodovae* and *E. hirsutus* from Sakhalin Isl.; *E. dentatus*, *E. krivolutskiji*, *E. perelae*, and *E. polygonatus* from the Maritime krai; *E. vitimicus* from the Republic of Buryatia; *E. chadaevae* from the Kemerovo oblast. Some ecological and faunistic papers (Titova 1972, 1973; Ghilarov and Perel 1973; Molodova 1973; Alekseeva 1974; Kurcheva 1977; Markelov and Mineeva 1981; Rybalov 2002; Ganin 1997, 2006; Vorobiova et al. 2002; Dyachkov 2017; Nefediev et al. 2017a, 2017c, 2018; Nefediev 2019) provided new data of *Escaryus* species, including four other species, namely *E. chichibuensis* Shinohara, 1955, *E. japonicus* Attems, 1927, *E. koreanus* Takakuwa, 1937, and *E. retusidens* Attems, 1904.

State of knowledge

The published records of Geophilomorpha from Asian Russia refer to 38 nominal species, arranged in eight genera (Table 1). However, the taxonomic validity of ≥ 19 species is uncertain, including 14 species that are known from Asian Russia only (Table 1). The taxonomic status of most of these species has never been revised since they were originally described. Of all the species reported from Asian Russia, only nine are also known from European Russia, where, a total of 41 species from 17 genera have been reported so far (Volkova 2016; Zuev and Evsyukov 2016; Dyachkov and Bonato 2022).

The records of *Tygarrup javanicus* and *Geophilus flavus* from hothouses in Western Siberia by Nefediev et al. (2017a; Nefediev 2019) seems to be due to anthropochore introduction. However, the occurrence of *Geophilus flavus* outside hothouses in Asian Russia requires confirmation. Gerstfeldt (1859) identified a sole specimen from Eastern Siberia (Zabaykalsky krai) as *Arthronomalus longicornis* (= *Geophilus flavus*), but Sseliwanoff (1884: 90) questioned this identification. Moreover, the nominal species *Schizotaenia ornata* Folkmanová & Dobroruka, 1960 was mentioned by Zalesskaja et al. (1982) from Western Siberia, however without providing information on specimens or published sources. This nominal species was considered a junior synonym of *Geophilus proximus* by Zalesskaja et al. (1982), but was later synonymized under *G. flavus* by Bonato and Minelli (2014). Nefediev et al. (2017a) suggested that some previous records of *G. flavus* from the former USSR may be reported under the name *G. proximus*.

Other species require confirmation from Asian Russia. The records of *Strigamia acuminata* from Far East and *S. transsilvanica* from Western Siberia and Far East are dubious because of possible confusion with other species (Bonato et al. 2012, 2023). Moreover, Titova (1972, 1973) indicated the presence of *Escaryus retusidens* from the Russian Far East, but she did not mention material from that region when she listed the studied specimens. Nefediev et al. (2017a, 2017c, 2018) indicated this species from the Far East with reference to Titova (1972, 1973). It is worth noting that *E. retusidens* has never been recorded during ecological studies in Eastern Siberia (Alekseeva 1974; Vorobiova 1999; Vorobiova et al. 2002; Rybalov 2002) or the Far East (Kurcheva 1977; Ganin 1997, 2006, 2011).

Our synthesis of all published information on Geophilomorpha from Asian Russia shows that the knowledge of this fauna is very far from being satisfactory. We hope that this work may provide a background reference and will prompt further investigations.

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Conflict of interest

The authors have declared that no competing interests exist.

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Data availability

All of the data that support the findings of this study are available in the main text.

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